AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (original): An apparatus for generating optical pulses, wherein each pulse may have individualized characteristics, the apparatus comprising:

laser means for generating the bursts of composite pulses;

control means that controls the laser means; and

beam manipulation means for monitoring the wavelength characteristics of the pulses comprising the composite pulse bursts and generating feedback data for the control means for pulse wavelength control.

2. (original): An apparatus as claimed in claim 1, wherein the laser means comprises a fiber amplifier.

3. (currently amended): An apparatus as claimed in claim 2, wherein the laser means further comprise at least one stretcher ~~grating~~ and at least one grating compressor.

4. (original): The apparatus as claimed in claim 1, wherein the beam manipulation means comprise:

a power meter that measures the power of the laser pulses output from the laser means;

a photodiode that measures a repetition rate of the laser pulses; and

an optical gating device that measures the pulse duration of the laser pulses.

5. (original): The apparatus as claimed in claim 1, wherein the beam manipulation means comprise means for optically converting the fundamental frequency of a percentage of the generated laser pulses to one or more other optical frequencies.

6. (original): The apparatus as claimed in claim 5, the means for converting an optical frequency comprising at least one optical member that converts a portion of the fundamental of the laser pulses into at least one higher order harmonic signal.

7. (original): The apparatus as claimed in claim 6, wherein the optical member device comprises at least one non-linear crystal device with a controller that controls the orientation of the at least one non-linear crystal with respect to the input laser pulses.

8. (original): The apparatus as claimed in claim 5, wherein the means for converting an optical frequency further comprise a spectrometer that measures predetermined parameters of pulses output from the non-linear crystal device and generates feedback for the control means.

9. (original): The apparatus as claimed in claim 1, wherein the beam manipulation means comprises:

a telescopic optical device to control the size, shape, divergence or polarization of the laser pulses input into the beam manipulation means; and

steering optics that control an impingement location of the laser pulses on the target substrate.

10. (original): The apparatus as claimed in claim 9, the apparatus further comprising a beam profiler that monitors characteristics of laser pulses and generates feedback for the control means.

11. (original): An end use device for modifying the refractive index of a target substrate, wherein the end device at least comprises an apparatus according to claim 1.

12. (original): An end use device for surface marking, sub-surface marking and surface texturing of a target substrate, wherein the end device at least comprises an apparatus according to claim 1.

13. (original): An end use device for fabricating holes, channels or vias in a target substrate, wherein the end device at least comprises an apparatus according to claim 1.

14. (original): An end use device for the deposition or removal of thin layers of material on a target substrate, wherein the end device comprises an apparatus according to claim 1.

15. (original): An apparatus for generating optical pulses, wherein each pulse may have individualized characteristics, the apparatus comprising:

laser means for generating the bursts of composite pulses;

control means that controls the laser means; and

beam manipulation means for monitoring the pulsewidth characteristics of the pulses comprising the composite pulse bursts and generating feedback data for the control means for pulsewidth control.

16. (original): An apparatus as claimed in claim 1, wherein the laser means comprises a fiber amplifier.

17. (currently amended): An apparatus as claimed in claim 16, wherein the laser means further comprise at least one stretcher ~~grating~~ and at least one grating compressor.

18. (original): The apparatus as claimed in claim 15, wherein the beam manipulation means comprise an optical gating device that measures the pulse duration of the laser pulses.

19. (original): The apparatus as claimed in claim 18, wherein the beam manipulation means further comprise:

a power meter that measures the power of the laser pulses output from the laser means; and

a photodiode that measures a repetition rate of the laser pulses.

20. (original): The apparatus as claimed in claim 14, wherein the beam manipulation means comprise means for optically converting the fundamental frequency of a percentage of the generated laser pulses to one or more other optical frequencies.

21. (original): The apparatus as claimed in claim 20, the means for converting an optical frequency comprising at least one optical member that converts a portion of the fundamental of the laser pulses into at least one higher order harmonic signal.

22. (original): The apparatus as claimed in claim 21, wherein the optical member device comprises at least one non-linear crystal device with a controller that controls the orientation of the at least one non-linear crystal with respect to the input laser pulses.

23. (original): The apparatus as claimed in claim 20, wherein the means for converting an optical frequency further comprise a spectrometer that measures predetermined parameters of pulses output from the non-linear crystal device and generates feedback for the control means.

24. (original): The apparatus as claimed in claim 15, wherein the beam manipulation means comprises:

a telescopic optical device to control the size, shape, divergence or polarization of the laser pulses input into the beam manipulation means; and

steering optics that control an impingement location of the laser pulses on the target substrate.

25. (original): The apparatus as claimed in claim 14, the apparatus further comprising a beam profiler that monitors characteristics of laser pulses and generates feedback for the control means.

26. (original): An end use device for modifying the refractive index of a target substrate, wherein the end device at least comprises an apparatus according to claim 15.

27. (original): An end use device for surface marking, sub-surface marking and surface texturing of a target substrate, wherein the end device at least comprises an apparatus according to claim 15.

28. (original): An end use device for fabricating holes, channels or vias in a target substrate, wherein the end device at least comprises an apparatus according to claim 15.

29. (original): An end use device for the deposition or removal of thin layers of material on a target substrate, wherein the end device comprises an apparatus according to claim 15.

30. (original): An apparatus for generating optical pulses, wherein each pulse may have individualized characteristics, the apparatus comprising:

laser means for generating the bursts of composite pulses;

control means that controls the laser means; and

beam manipulation means for monitoring the temporal delay characteristics of the pulses comprising the composite pulse bursts and generating feedback data for the control means for temporal delay control.

31. (original): An apparatus as claimed in claim 30, wherein the laser means comprises a fiber amplifier.

32. (currently amended): An apparatus as claimed in claim 31, wherein the laser means further comprise at least one stretcher ~~grating~~ and at least one grating compressor.

33. (original): The apparatus as claimed in claim 30, wherein the beam manipulation means comprise a photodiode that measures the temporal delay.

34. (original): The apparatus as claimed in claim 33, wherein the beam manipulation means further comprise:

a power meter that measures the power of the laser pulses output from the laser means and

an optical gating device that measures the pulse duration of the laser pulses.

35. (original): The apparatus as claimed in claim 30, wherein the beam manipulation means comprise means for optically converting the fundamental frequency of a percentage of the generated laser pulses to one or more other optical frequencies.

36. (original): The apparatus as claimed in claim 35, the means for converting an optical frequency comprising at least one optical member that converts a portion of the fundamental of the laser pulses into at least one higher order harmonic signal.

37. (original): The apparatus as claimed in claim 36, wherein the optical member device comprises at least one non-linear crystal device with a controller that controls the orientation of the at least one non-linear crystal with respect to the input laser pulses.

38. (original): The apparatus as claimed in claim 35, wherein the means for converting an optical frequency further comprise a spectrometer that measures predetermined parameters of pulses output from the non-linear crystal device and generates feedback for the control means.

39. (original): The apparatus as claimed in claim 30, wherein the beam manipulation means comprises:

a telescopic optical device to control the size, shape, divergence or polarization of the laser pulses input into the beam manipulation means; and

steering optics that control an impingement location of the laser pulses on the target substrate.

40. (original): The apparatus as claimed in claim 39, the apparatus further comprising a beam profiler that monitors characteristics of laser pulses and generates feedback for the control means.

41. (original): An end use device for modifying the refractive index of a target substrate, wherein the end device at least comprises an apparatus according to claim 30.

42. (original): An end use device for surface marking, sub-surface marking and surface texturing of a target substrate, wherein the end device at least comprises an apparatus according to claim 30.

43. (original): An end use device for fabricating holes, channels or vias in a target substrate, wherein the end device at least comprises an apparatus according to claim 30.

44. (original): An end use device for the deposition or removal of thin layers of material on a target substrate, wherein the end device comprises an apparatus according to claim 30.

45. (original): An apparatus for generating optical pulses, wherein each pulse may have individualized characteristics, the apparatus comprising:

laser means for generating the bursts of composite pulses;

control means that controls the laser means; and

beam manipulation means for monitoring a variable repetition rate of the composite pulse bursts and generates feedback data for the control means for the variable repetition rate.

46. (original): An apparatus as claimed in claim 45, wherein the laser means comprises a fiber amplifier.

47. (currently amended): An apparatus as claimed in claim 46, wherein the laser means further comprise at least one stretcher ~~grating~~ and at least one grating compressor.

48. (original): The apparatus as claimed in claim 45, wherein the beam manipulation means comprise a photodiode that measures a repetition rate of the laser pulses.

49. (original): The apparatus as claimed in claim 48, wherein the beam manipulation means comprise:

a power meter that measures the power of the laser pulses output from the laser means; and

an optical gating device that measures the pulse duration of the laser pulses.

50. (original): The apparatus as claimed in claim 45, wherein the beam manipulation means comprise means for optically converting the fundamental frequency of a percentage of the generated laser pulses to one or more other optical frequencies.

51. (original): The apparatus as claimed in claim 50, the means for converting an optical frequency comprising at least one optical member that converts a portion of the fundamental of the laser pulses into at least one higher order harmonic signal.

52. (original): The apparatus as claimed in claim 51, wherein the optical member device comprises at least one non-linear crystal device with a controller that controls the orientation of the at least one non-linear crystal with respect to the input laser pulses.

53. (original): The apparatus as claimed in claim 50, wherein the means for converting an optical frequency further comprise a spectrometer that measures predetermined parameters of pulses output from the non-linear crystal device and generates feedback for the control means.

54. (original): The apparatus as claimed in claim 45, wherein the beam manipulation means comprises:

a telescopic optical device to control the size, shape, divergence or polarization of the laser pulses input into the beam manipulation means; and

steering optics that control an impingement location of the laser pulses on the target substrate.

55. (original): The apparatus as claimed in claim 54, the apparatus further comprising a beam profiler that monitors characteristics of laser pulses and generates feedback for the control means.

56. (original): An end use device for modifying the refractive index of a target substrate, wherein the end device at least comprises an apparatus according to claim 45.

57. (original): An end use device for surface marking, sub-surface marking and surface texturing of a target substrate, wherein the end device at least comprises an apparatus according to claim 45.

58. (original): An end use device for fabricating holes, channels or vias in a target substrate, wherein the end device at least comprises an apparatus according to claim 45.

59. (original): An end use device for the deposition or removal of thin layers of material on a target substrate, wherein the end device comprises an apparatus according to claim 45.

60. (original): An apparatus for generating optical pulses, wherein each pulse may have individualized characteristics, the apparatus comprising:

laser means for generating the bursts of composite pulses;

control means that controls the laser means; and

beam manipulation means for monitoring the wavelength, pulsewidth and variable repetition rate characteristics of the pulses comprising the composite pulse bursts and generating feedback data for the control means for pulse wavelength, pulsewidth and repetition rate control.

61. (original): An apparatus as claimed in claim 60, wherein the laser means comprises a fiber amplifier.

62. (currently amended): An apparatus as claimed in claim 61, wherein the laser means further comprise at least one stretcher ~~grating~~ and at least one grating compressor.

63. (original): The apparatus as claimed in claim 60, wherein the beam manipulation means comprise:

a photodiode that measures a repetition rate of the laser pulses; and

an optical gating device that measures the pulse duration of the laser pulses.

64. (original): The apparatus as claimed in claim 63, wherein the beam manipulation means further comprise a power meter that measures the power of the laser pulses output from the laser means.

65. (original): The apparatus as claimed in claim 60, wherein the beam manipulation means comprise means for optically converting the fundamental frequency of a percentage of the generated laser pulses to one or more other optical frequencies.

66. (original): The apparatus as claimed in claim 65, the means for converting an optical frequency comprising at least one optical member that converts a portion of the fundamental of the laser pulses into at least one higher order harmonic signal.

67. (original): The apparatus as claimed in claim 66, wherein the optical member device comprises at least one non-linear crystal device with a controller that controls the orientation of the at least one non-linear crystal with respect to the input laser pulses.

68. (original): The apparatus as claimed in claim 65, wherein the means for converting an optical frequency further comprise a spectrometer that measures predetermined parameters of pulses output from the non-linear crystal device and generates feedback for the control means.

69. (original): The apparatus as claimed in claim 60, wherein the beam manipulation means comprises:

a telescopic optical device to control the size, shape, divergence or polarization of the laser pulses input into the beam manipulation means; and

steering optics that control an impingement location of the laser pulses on the target substrate.

70. (original): The apparatus as claimed in claim 69, the apparatus further comprising a beam profiler that monitors characteristics of laser pulses and generates feedback for the control means.

71. (original): An end use device for modifying the refractive index of a target substrate, wherein the end device at least comprises an apparatus according to claim 60.

72. (original): An end use device for surface marking, sub-surface marking and surface texturing of a target substrate, wherein the end device at least comprises an apparatus according to claim 60.

73. (original): An end use device for fabricating holes, channels or vias in a target substrate, wherein the end device at least comprises an apparatus according to claim 60.

74. (original): An end use device for the deposition or removal of thin layers of material on a target substrate, wherein the end device comprises an apparatus according to claim 60.

75. (original): An apparatus for generating optical pulses, wherein each pulse may have individualized characteristics, the apparatus comprising:

laser means for generating the bursts of composite pulses;

control means that controls the laser means; and

beam manipulation means for monitoring the polarization characteristics of the pulses comprising the composite pulse bursts and generating feedback data for the control means for polarization control.

76. (original): An apparatus as claimed in claim 75, wherein the laser means comprises a fiber amplifier.

77. (currently amended): An apparatus as claimed in claim 76, wherein the laser means further comprise at least one stretcher ~~grating~~ and at least one grating compressor.

78. (original): The apparatus as claimed in claim 75, wherein the beam manipulation means comprise:

a power meter that measures the power of the laser pulses output from the laser means;

a photodiode that measures a repetition rate of the laser pulses; and

an optical gating device that measures the pulse duration of the laser pulses.

79. (original): The apparatus as claimed in claim 75, wherein the beam manipulation means comprise means for optically converting the fundamental frequency of a percentage of the generated laser pulses to one or more other optical frequencies.

80. (original): The apparatus as claimed in claim 79, the means for converting an optical frequency comprising at least one optical member that converts a portion of the fundamental of the laser pulses into at least one higher order harmonic signal.

81. (original): The apparatus as claimed in claim 80, wherein the optical member device comprises at least one non-linear crystal device with a controller that controls the orientation of the at least one non-linear crystal with respect to the input laser pulses.

82. (original): The apparatus as claimed in claim 79, wherein the means for converting an optical frequency further comprise a spectrometer that measures predetermined parameters of pulses output from the non-linear crystal device and generates feedback for the control means.

83. (original): The apparatus as claimed in claim 75, wherein the beam manipulation means comprises:

a telescopic optical device to control the size, shape, divergence or polarization of the laser pulses input into the beam manipulation means; and

steering optics that control an impingement location of the laser pulses on the target substrate.

84. (original): The apparatus as claimed in claim 83, the apparatus further comprising a beam profiler that monitors characteristics of laser pulses and generates feedback for the control means.

85. (original): An end use device for modifying the refractive index of a target substrate, wherein the end device at least comprises an apparatus according to claim 75.

86. (original): An end use device for surface marking, sub-surface marking and surface texturing of a target substrate, wherein the end device at least comprises an apparatus according to claim 75.

87. (original): An end use device for fabricating holes, channels or vias in a target substrate, wherein the end device at least comprises an apparatus according to claim 75.

88. (original): An end use device for the deposition or removal of thin layers of material on a target substrate, wherein the end device comprises an apparatus according to claim 75.

89. (original): An apparatus for impinging laser pulses on a target substrate, the apparatus comprising:

laser means for generating the bursts of composite pulses;

control means that controls the laser means; and

beam manipulation means for monitoring characteristics of the composite pulse bursts output from the laser means to generate feedback data for the control means, and for manipulating the characteristics of the composite pulse bursts; and

means for positioning the target substrate.

90. (original): The apparatus as claimed in claim 89, wherein the beam manipulation means comprising:

a power meter that measures the power of the laser pulses output from the laser means;

a photodiode that measures the repetition rate of the laser pulses; and

an optical gating device that measures the pulse duration of the laser pulses.

91. (original): The apparatus as claimed in claim 89, wherein the beam manipulation means comprise means for optically converting the fundamental frequency of a percentage of the generated laser pulses to one or more other optical frequencies.

92. (original): The apparatus as claimed in claim 91, the means for converting an optical frequency comprising at least one optical member that converts a portion of the fundamental of the laser pulses into at least one higher order harmonic signal.

93. (original): The apparatus as claimed in claim 92, wherein the optical member device comprises at least one non-linear crystal device.

94. (original): The apparatus as claimed in claim 93, wherein the non-linear crystal device further comprises a controller that controls the orientation of the at least one non-linear crystal with respect to the input laser pulses.

95. (original): The apparatus as claimed in claim 93, wherein the non-linear crystal device further comprises a dual-lens telescope that focuses the input laser pulses into the at least one non-linear crystal, wherein the at least one non-linear crystal is disposed between the lenses of the telescope.

96. (original): The apparatus as claimed in claim 95, wherein the dual-lens telescope collimates the output of the at least one non-linear crystal.

97. (original): The apparatus as claimed in claim 92, wherein the means for converting an optical frequency further comprise a spectrometer that measures predetermined parameters of pulses output from the non-linear crystal device.

98. (original): The apparatus as claimed in claim 89, wherein the beam manipulation means comprises:

a telescopic optical device to control the size, shape, divergence or polarization of the laser pulses input into the means for manipulating; and

steering optics that control the impingement location of the laser pulses on the target.

99. (original): The apparatus as claimed in claim 98, the apparatus further comprising:

a beam profiler that monitors characteristics of laser pulses output from the telescopic optical device; and

a position detector that determines a position of the laser pulses output from the steering optics.

100. (original): The apparatus as claimed in claim 98, wherein the telescopic optical device comprises at least two cylindrical lens telescopes aligned along an optical axis traversed by the laser pulses.

101. (original): The apparatus as claimed in claim 91, wherein the apparatus further comprises:

means for directing the fundamental and/or converted frequencies of the laser pulses and the impingement location of the pulses with respect to the target substrate;

means for focusing the fundamental and/or converted frequencies of the laser pulses;

102. (original): The apparatus as claimed in claim 89, the means for positioning comprising:

a mounting surface for translating the target with respect to the laser pulses; and

a motion control device coupled to the mounting surface.

103. (original): The apparatus as claimed in claim 102, the means for positioning further comprising an environmental chamber, wherein the mounting surface and the motion control device are disposed within the environmental chamber.

104. (original): An end use device for modifying the refractive index of a target substrate, wherein the end device at least comprises an apparatus according to claim 89.

105. (original): An end use device for surface marking, sub-surface marking and surface texturing of a target substrate, wherein the end device at least comprises an apparatus according to claim 89.

106. (original): An end use device for fabricating holes, channels or vias in a target substrate, wherein the end device at least comprises an apparatus according to claim 89.

107. (original): An end use device for the deposition or removal of thin layers of material on a target substrate, wherein the end device comprises an apparatus according to claim 89.